



# Trauma cranico grave: pre ospedaliero



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Hypoxemia and arterial hypotension at the accident scene in head injury.





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of  **TRAUMA**<sup>®</sup>  
Injury, Infection, and Critical Care

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Volume 40(5)

May 1996

pp 764-767

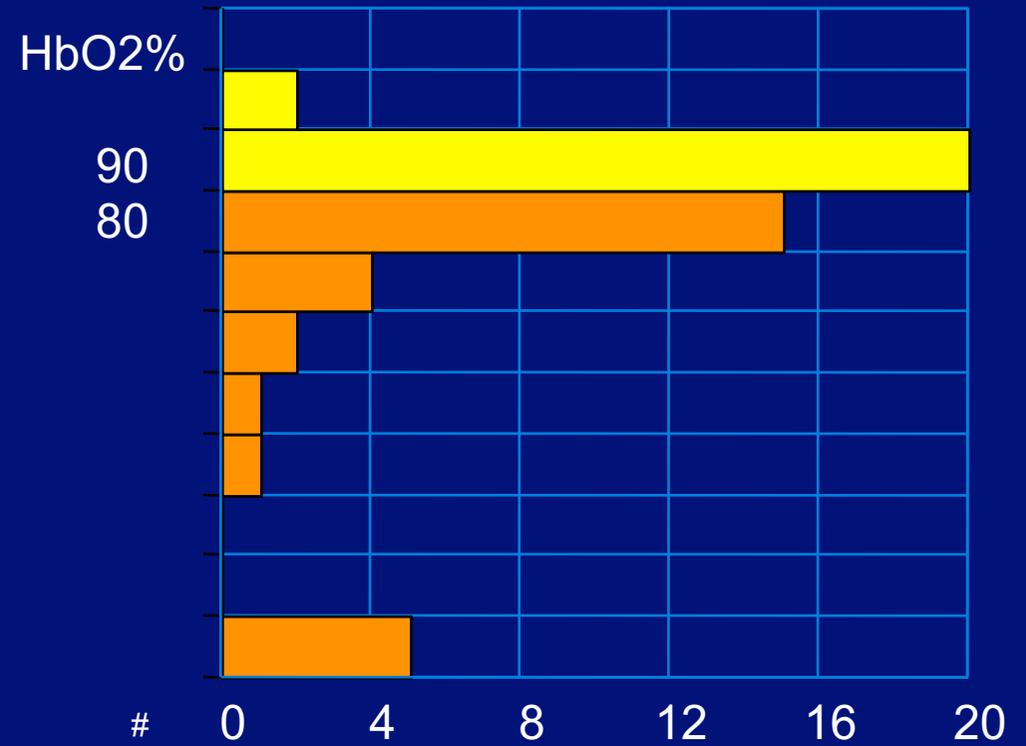
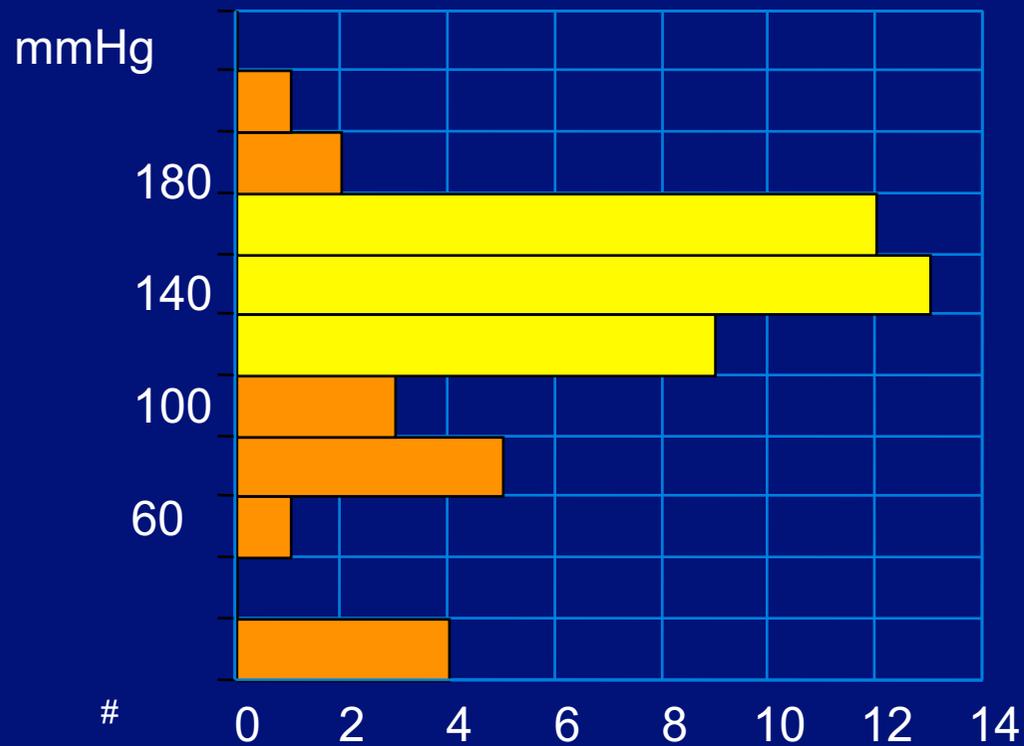
**Hypoxemia and Arterial Hypotension at the Accident Scene in Head Injury**  
[Article]

Stocchetti, Nino MD; Furlan, Adriano MD; Volta, Franco MD





# Arterial Pressure and Saturation at the accident scene

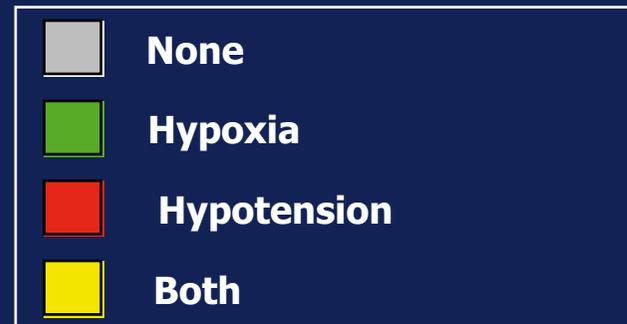
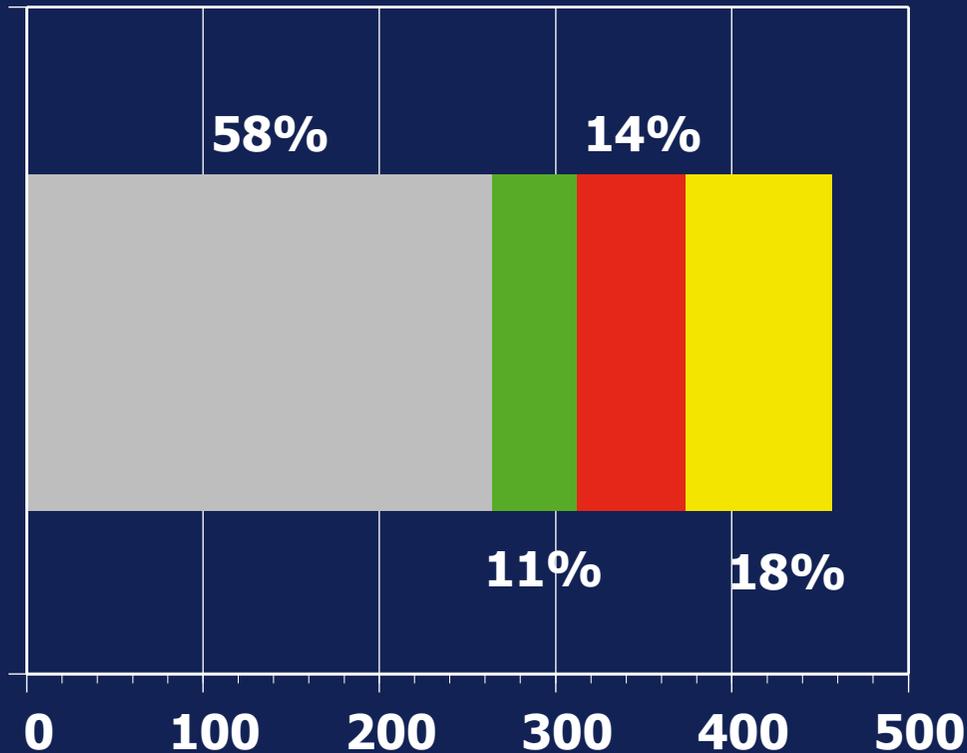




% data

	<b>Sist&lt;100 mmHg %</b>	<b>Sat&lt;90%</b>
<b>Scene</b>	26	58
<b>Transport</b>	25	10
<b>Admission</b>	18	10

# Secondary insults first 24 hrs



Mutually exclusive

**Hypotension** = SBP  $\leq$  95 mmHg or cyanosis or No peripheral pulse  
**Hypoxia** = SaO<sub>2</sub>  $\leq$  90 or apnea or cyanosis



# Second insults

n = 717

	<b>GOS 1</b>
Neither	27%
Hypoxia	28
Hypotension	50% + PPV=67%
Both	57% + PPV=79%

JOURNAL OF APPLIED PHYSIOLOGY  
Vol. 23, No. 2, August 1967. Printed in U.S.A.

2218

# Effects of hypoxia and normocarbica on cerebral blood flow and metabolism in conscious man<sup>1</sup>

PETER J. COHEN, S. C. ALEXANDER,<sup>2</sup>  
THEODORE C. SMITH,<sup>3</sup> MARTIN REIVICH,<sup>4</sup>  
AND HARRY WOLLMAN

*Departments of Anesthesia and Neurology, University of Pennsylvania  
School of Medicine, Philadelphia, Pennsylvania*



# Hypoxia - Hypotension

$$\text{O}_2 \text{ Content} \times \text{CBF} = \text{O}_2 \text{ Delivery}$$


$$\text{O}_2 \text{ Content} \times \text{CBF} \uparrow = \text{O}_2 \text{ Delivery}$$



# Hypoxia - Hypotension

O<sub>2</sub> Content

x

CBF

=

O<sub>2</sub> Delivery



O<sub>2</sub> Content

x

CBF



=

O<sub>2</sub> Delivery

O<sub>2</sub> Content

x

CBF



=

O<sub>2</sub> Delivery





# Intubation and ventilation - 1

**ARCHIVES**  
OF  
**SURGERY**

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Volume 132(6)

June 1997

pp 592-597

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**Endotracheal Intubation in the Field Improves Survival in Patients With Severe Head Injury**  
[Paper]

Winchell, Robert J. MD; Hoyt, David B. MD

For the Trauma Research and Education Foundation of San Diego.

From the Division of Trauma, Department of Surgery, University of California, San Diego (Winchell, and Hoyt).



# Intubation and ventilation - 1

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Volume 132(6)

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### **Endotracheal Intubation in the Field Improves Survival in Patients With Severe Head Injury** [Paper]

*The Journal of TRAUMA® Injury, Infection, and Critical Care*

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## **The Effect of Paramedic Rapid Sequence Intubation on Outcome in Patients with Severe Traumatic Brain Injury**

*Daniel P. Davis, MD, David B. Hoyt, MD, Mel Ochs, MD, Dale Fortlage, BA, Troy Holbrook, PhD, Lawrence K. Marshall, MD, and Peter Rosen, MD*



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**ORIGINAL ARTICLE**

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# Effects of 2 Patterns of Prehospital Care on the Outcome of Patients With Severe Head Injury

*Stefano Di Bartolomeo, MD; Gianfranco Sanson, RN; Giuseppe Nardi, MD;  
Franca Scian, RN; Vanni Michelutto, MD; Luca Lattuada, MD*

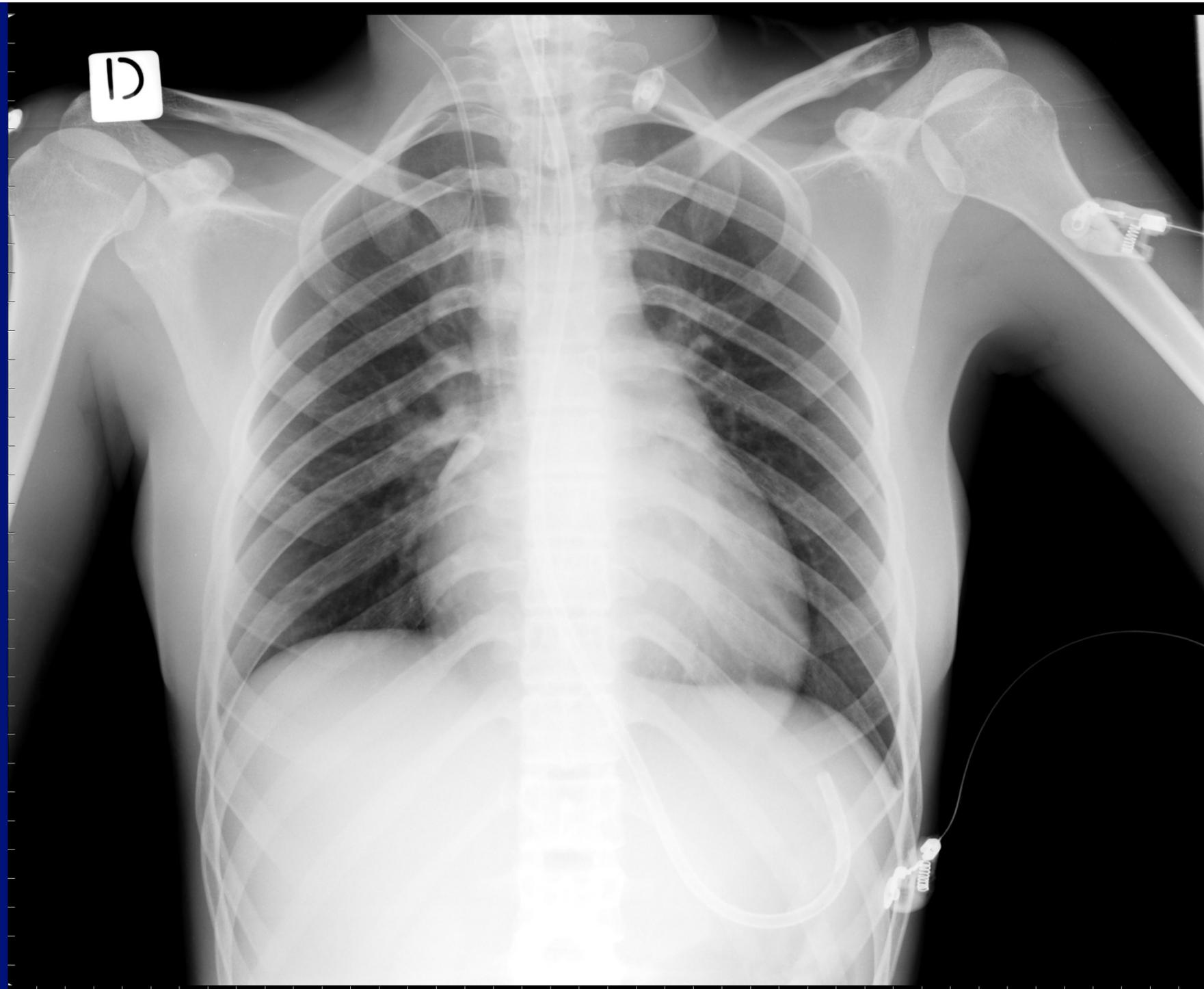
**Table 1. Medical Procedures Expected by Rescue Facilities and Rate of Actual Performance\***

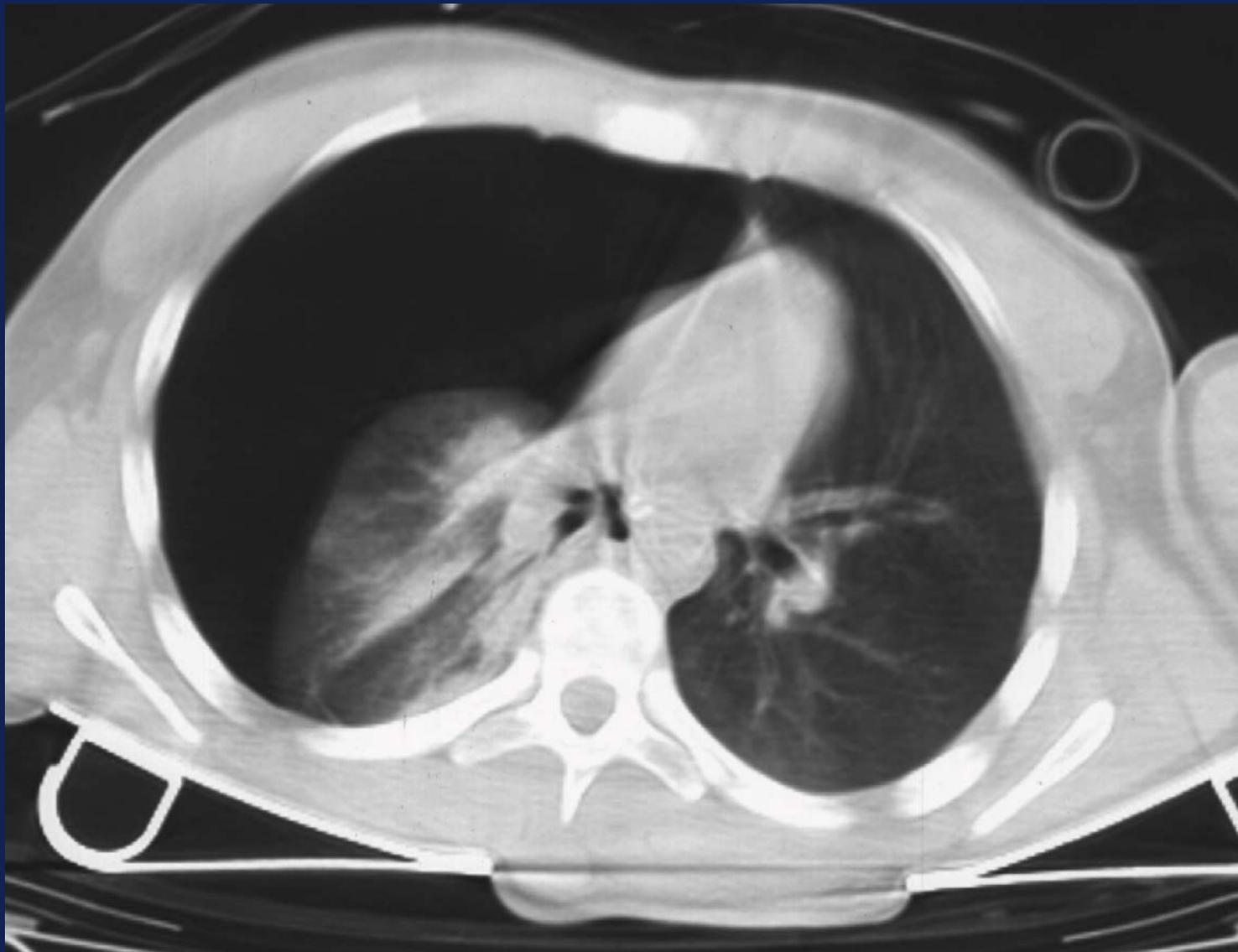
Procedures Expected and Usually Performed	Rate of Performance, No. (%)	
	Group A (n = 92)	Group B (n = 92)
Ventilation†	64 (70)	Not recorded
Cricothyroidotomy	0‡	...
Chest drainage	4 (4)	...
Pericardiocentesis	0‡	...
Peripheral or central large bore intravenous line(s)§	92 (100)	74 (80)
Intravenous fluids	89 (97)	60 (65)
Medications	Not recorded	0‡
Defibrillation	0‡	0‡



**Table 8. Multiple Logistic Regression Analysis  
With Trauma Death as the Dependent Variable\***

<b>Independent Variable</b>	<b><i>P</i> Value†</b>
Age	<.001‡
Sex	.94
ISS	.001‡
RTS	.002‡
Pattern of prehospital rescue	.68





SN 11290  
DFOV 35.3cm  
STANDARD

01:52:47 AM  
512 X 512  
Mag = 1.00  
FL:  
ROT:

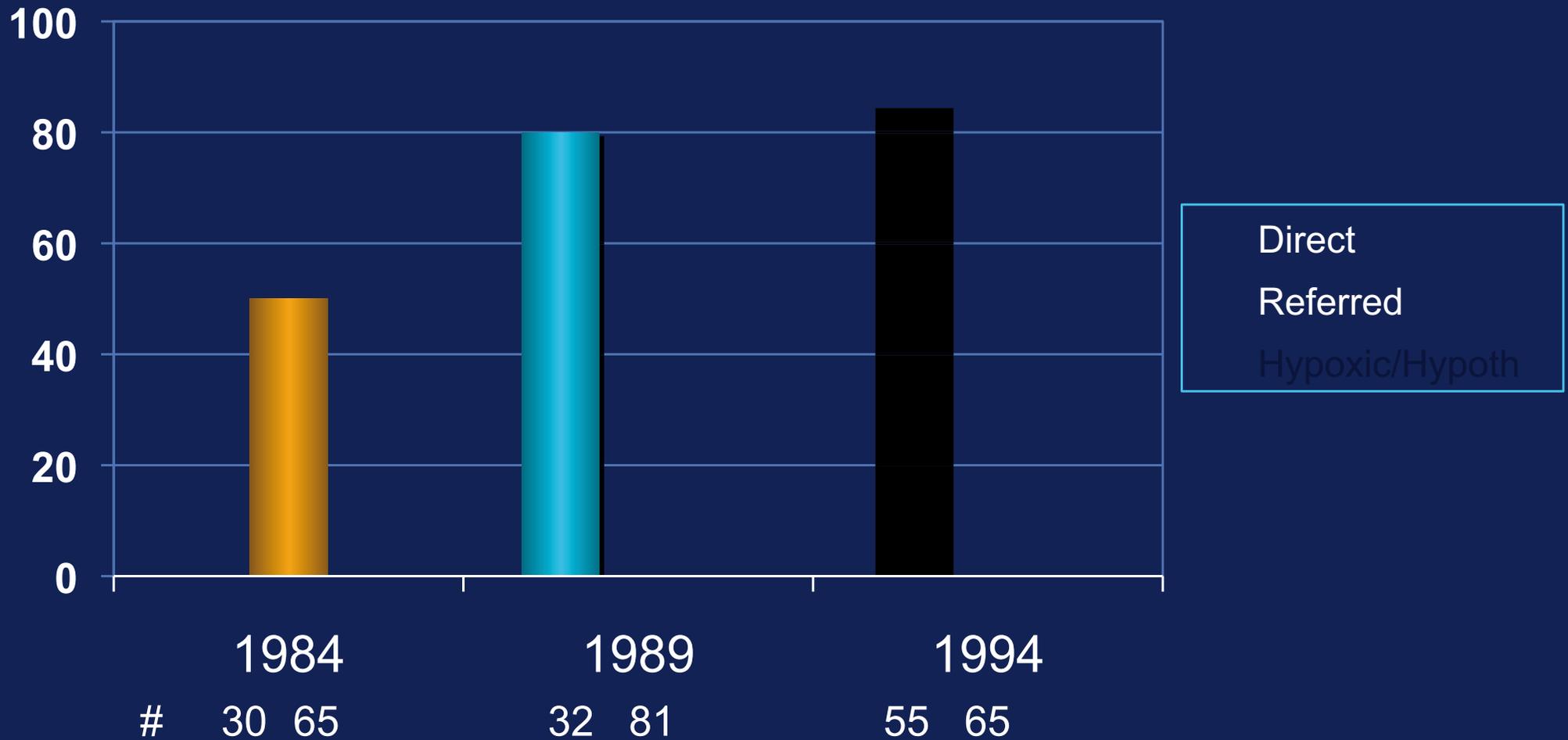


kV 120



# Intubation and secondary insults

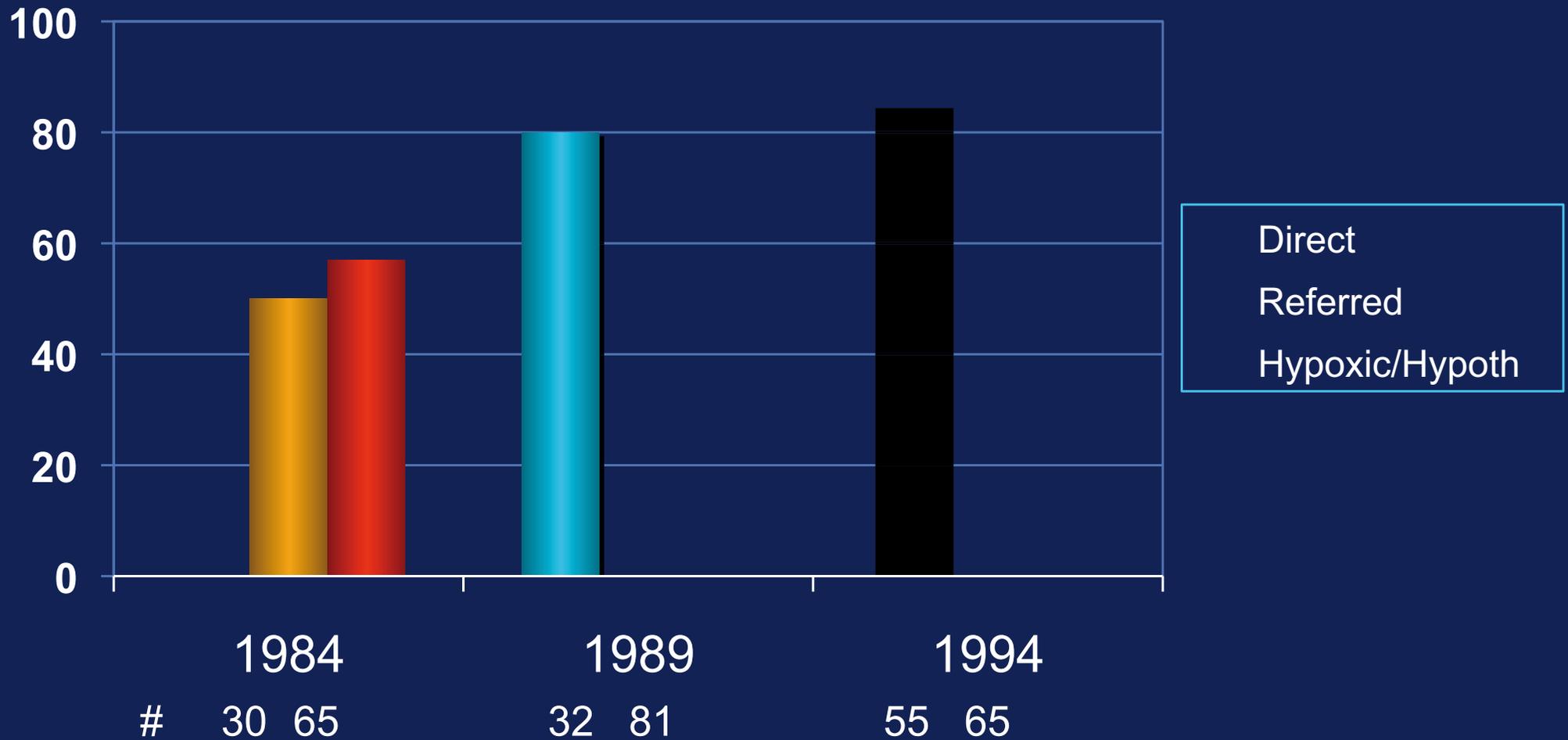
% data





# Intubation and secondary insults

% data





# Early care in head injury

Glasgow INS: eleven years survey

Intubation rate	Hypoxia	Extracranial Injuries	Arterial Hypoten.
11%	22%	31%	11%
82%	8%	11%	6%

*Teasdale GM: J Neurol Neurosurg Psychiatry 58:526-539, 1995*



# Early care in head injury

Glasgow INS: eleven years survey

Mortality	GR-MD
45%	40%
32%	58%

*Teasdale GM: J Neurol Neurosurg Psychiatry 58:526-539, 1995*



Intubazione precoce

Protezione vie aeree

Pa O<sub>2</sub> 100 mmHg

Pa CO<sub>2</sub> 35 mmHg



Intubazione precoce

Protezione vie aeree

Pa O<sub>2</sub> 100 mmHg

Pa CO<sub>2</sub> 35 mmHg

Instabilità cervicale

Fascicolazioni

Dolore



% data

	<b>Sist&lt;100 mmHg %</b>	<b>Sat&lt;90%</b>
<b>Scene</b>	26	58
<b>Transport</b>	25	10
<b>Admission</b>	18	10



Incannula almeno una grossa vena

Infondi salina

Misura PA, HR e Sat

→ PA sist > 110 mmHg

→ Perfusione

→ Osmolarità



Incannula almeno una grossa vena

Infondi salina

Non incannulare vene al collo

Misura PA, HR e Sat

→ PA sist > 110 mmHg

→ Perfusione

→ Osmolarità



Sondino nasogastrico

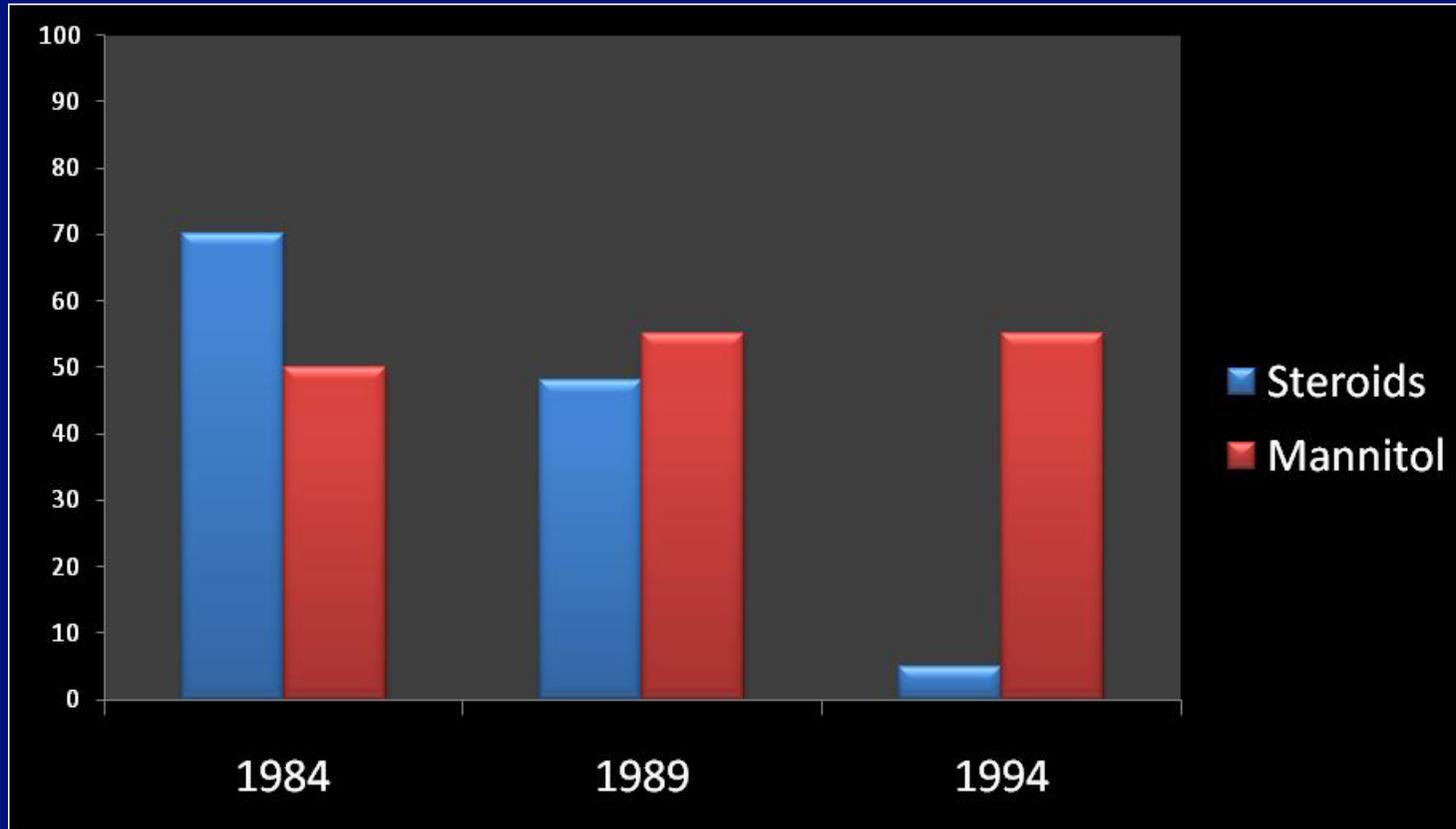
Catetere vescicale

Cerca le emorragie

Immobilizza fratture



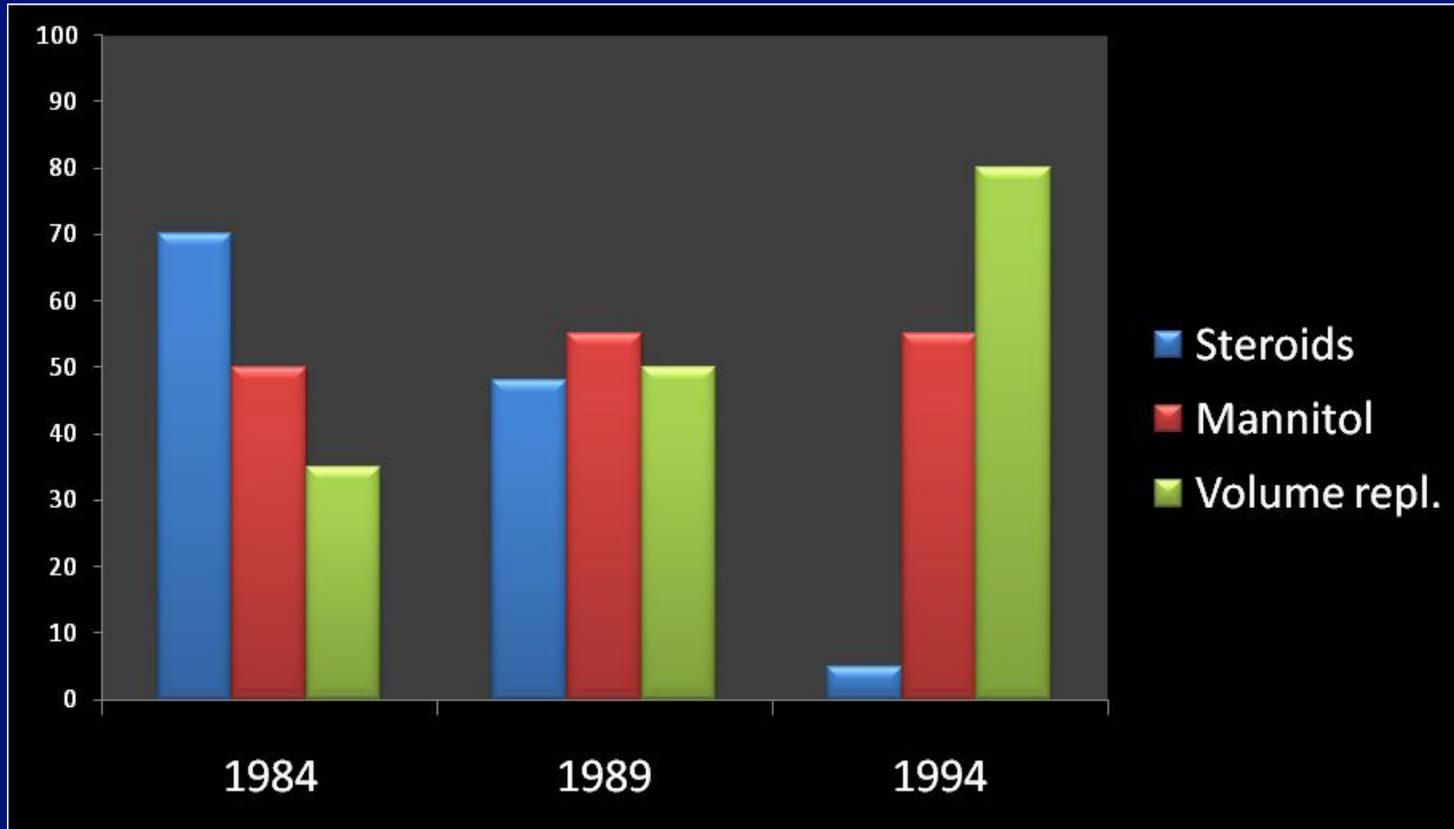
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Parma 1984- 1994



% data





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Volume 24, Supplement 1, 2007  
© Brain Trauma Foundation  
Pp. S-14–S-20  
DOI: 10.1089/neu.2007.9994

## II. Hyperosmolar Therapy

**SUSAN L. BRATTON,<sup>1</sup> RANDALL M. CHESTNUT,<sup>2</sup> JAMSHID GHAJAR,<sup>3,4</sup>  
FLORA F. MCCONNELL HAMMOND,<sup>5</sup> ODETTE A. HARRIS,<sup>6</sup> ROGER HARTL,<sup>3</sup>  
GEOFFREY T. MANLEY,<sup>7</sup> ANDREW NEMECEK,<sup>8</sup> DAVID W. NEWELL,<sup>9</sup> GUY ROSENTHAL,<sup>7</sup>  
JOOST SCHOUTEN,<sup>10</sup> LORI SHUTTER,<sup>11</sup> SHELLY D. TIMMONS,<sup>12</sup> JAMIE S. ULLMAN,<sup>13,14</sup>  
WALTER VIDETTA,<sup>15</sup> JACK E. WILBERGER,<sup>16</sup> and DAVID W. WRIGHT<sup>6</sup>**



## I. RECOMMENDATIONS

### *A. Level I*

There are insufficient data to support a Level I recommendation for this topic.

### *B. Level II*

Mannitol is effective for control of raised intracranial pressure (ICP) at doses of 0.25 gm/kg to 1 g/kg body weight. Arterial hypotension (systolic blood pressure < 90 mm Hg) should be avoided.

### *C. Level III*

Restrict mannitol use prior to ICP monitoring to patients with signs of transtentorial herniation or progressive neurological deterioration not attributable to extracranial causes.



# Primo trattamento - Farmaci

- Mantieni PA Sist  $>110$  mmHg
- Mannitolo solo se segni di incuneamento
- No steroidi
- Analgesia e sedazione dopo aver osservato la miglior risposta motoria



# Valutazione neurologica

Storia minima dell'accaduto  
anamnesi se possibile

Pressione arteriosa e saturazione

Diametro e reattività pupille

apertura occhi  
risposta verbale  
miglior risposta motoria e da che lato



### Post Enrollment GCS vs. GOS at 6 Month Post Injury

- Regardless of pupillary reaction

		GOS					Total
		Dead	Vegetative Status	Severe Disability	Moderate Disability	Good Recovery	
GCS							
	3	N 256	47	130	144	145	722
	Pct	35.46	6.51	18.01	19.94	20.08	
4	N	284	77	143	91	81	676
	Pct	42.01	11.39	21.15	13.46	11.98	
5	N	210	63	208	159	176	816
	Pct	25.74	7.72	25.49	19.49	21.57	



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Pp. 1131–1140

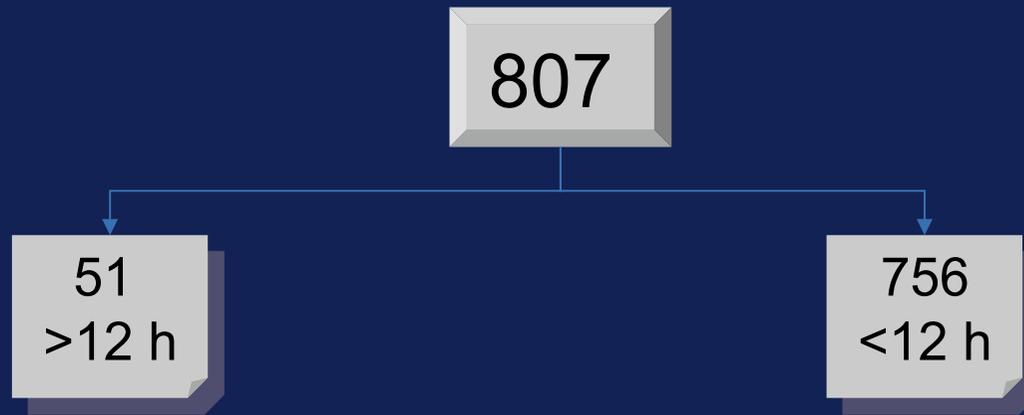
## Inaccurate Early Assessment of Neurological Severity in Head Injury

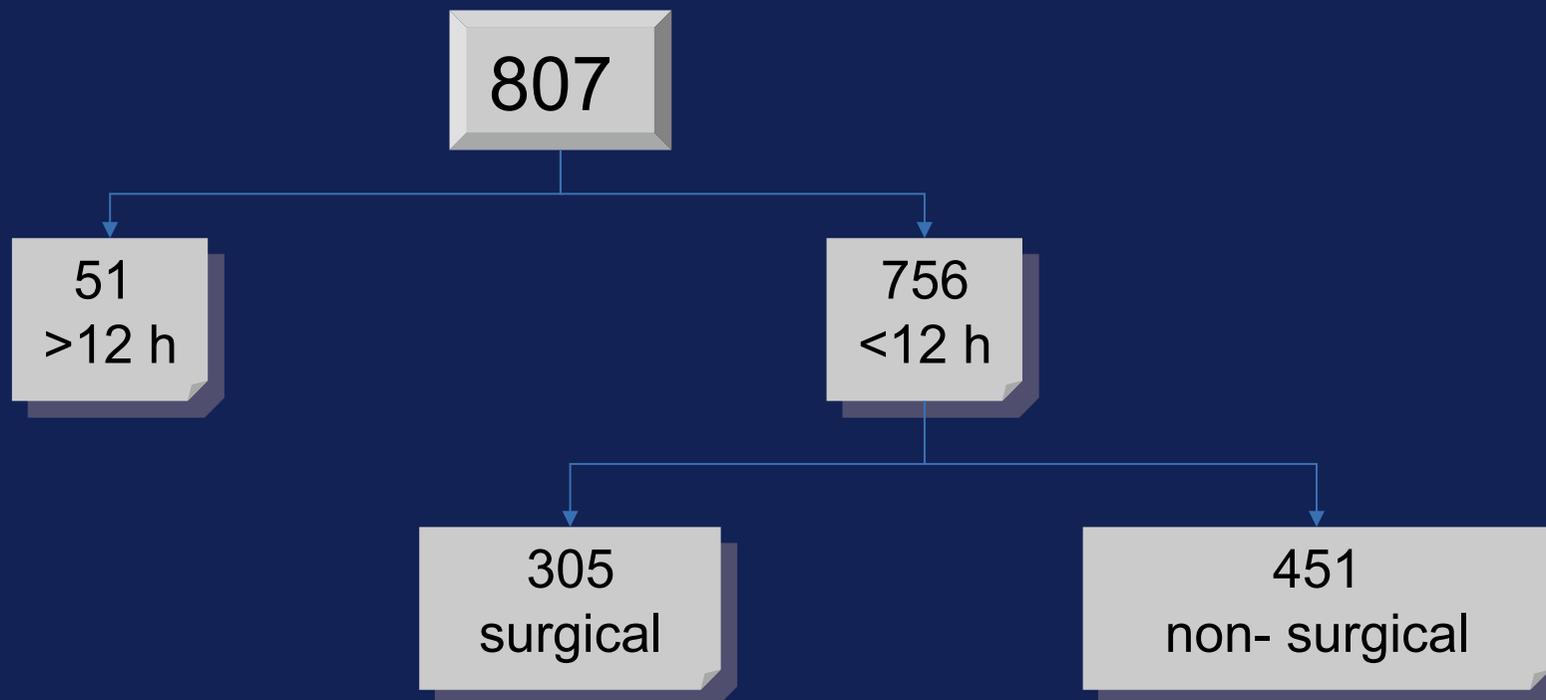
**NINO STOCCHETTI,<sup>1</sup> FRANCESCA PAGAN,<sup>1</sup> EMILIANA CALAPPI,<sup>1</sup>  
KATIA CANAVESI,<sup>1</sup> LUIGI BERETTA,<sup>2</sup> GIUSEPPE CITERIO,<sup>3</sup>  
MANUELA CORMIO,<sup>3</sup> and ANGELO COLOMBO<sup>1</sup>**

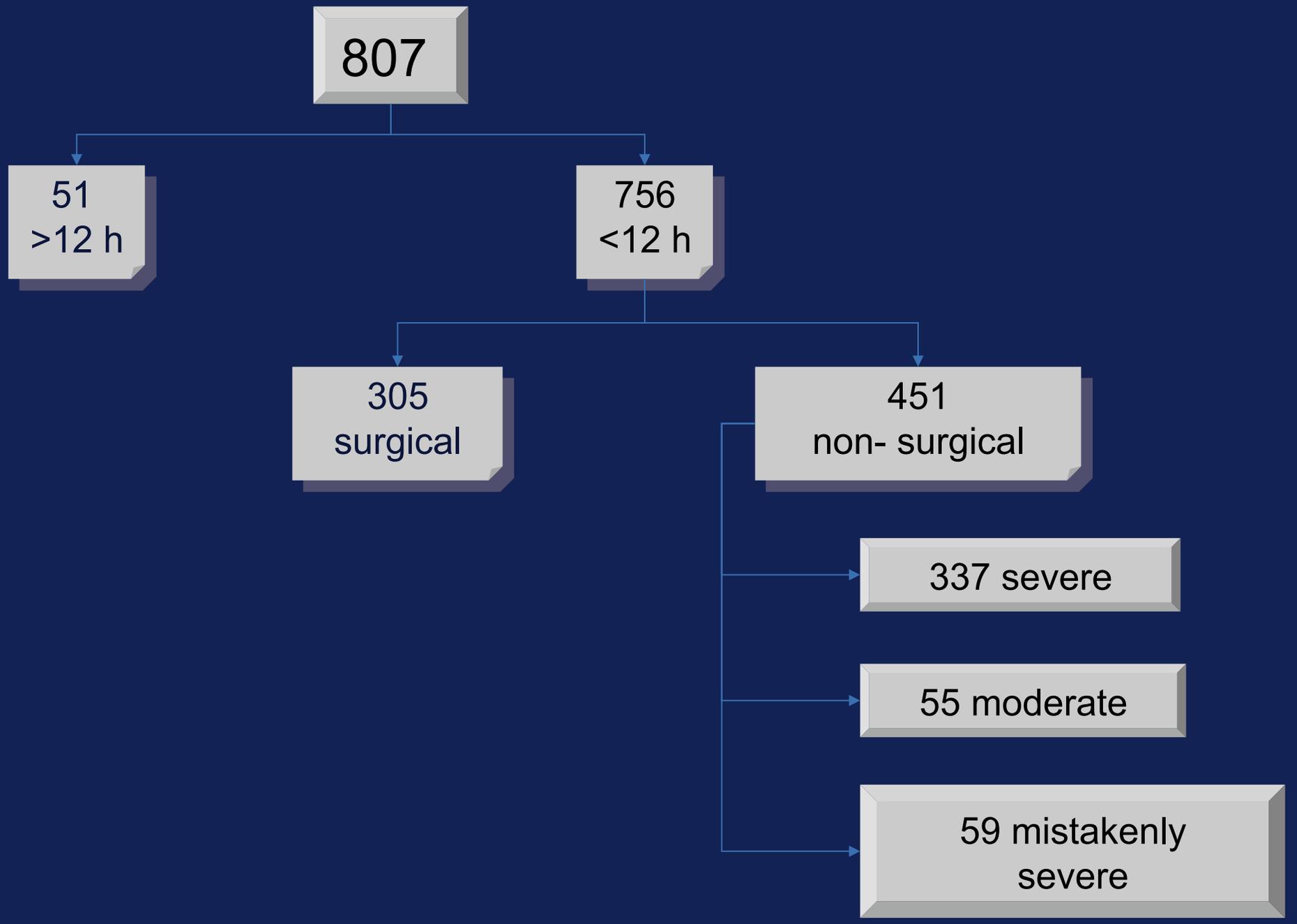


# Mistakenly severe

- no surgical intracranial masses
- could not follow commands at neurological assessment
- were dismissed from the ICU in  $\leq 3$  days to a regular ward
- having regained the ability to obey commands









# Trends in head injury outcome from 1989 to 2003 and the effect of neurosurgical care: an observational study

*H C Patel, O Bouamra, M Woodford, A T King, D W Yates, F E Lecky, on behalf of the Trauma Audit and Research Network*



	All SHI patients n=6921 (age 16-65)	
	Neurosurgical centres	Non-neurosurgical centres
Number of patients	4616	2305
Age (years, median, IQR)	28 (16-48)	34 (20-58)
Male (%; 95% CI)	3448 (75%; 73-76)	1642 (71%; 69-73)
ISS (median, IQR)	25 (18-33)	26 (18-35)
GCS (median, IQR)	3 (3-6)	4 (3-6)
Isolated head injury (95% CI)	2054 (44%; 43-46)	899 (39%; 37-41)
SBP <90 mm Hg (95% CI)	383 (8%; 8-9)	434 (19%; 17-20)
Transferred (95% CI)	2665 (58%; 56-59)	302 (13%; 12-14)
Deaths (95% CI)	1624 (35%; 34-37)	1406 (61%; 59-63)



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Deaths (95% CI)	1624 (35%; 34-37)	1406 (61%; 59-63)
Isolated, non-surgical SHI n=894 (age 16-65)		
Number of patients	552	342
Age (years, median, IQR)	33 (23-47)	31 (22-46)
ISS (median, IQR)	16 (10-25)	16 (10-25)
GCS (median, IQR)	4 (3-7)	5 (3-7)
SBP <90 mm Hg (%; 95% CI)	21 (4%; 2-5)	29 (9%; 6-12)
Patients transferred (%; 95% CI)	311 (56%; 52-60)	23 (7%; 4-9)
Deaths (%; 95% CI)	142 (26%; 22-29)	118 (34%; 29-40)



2305 (33%) of patients with severe TBI were treated only in non-neurosurgical centres

Such treatment was associated with a 26% increase in mortality

and a 2.15-fold increase in the odds of death adjusted for case mix compared with patients treated at a neurosurgical centre

ORIGINAL ARTICLE

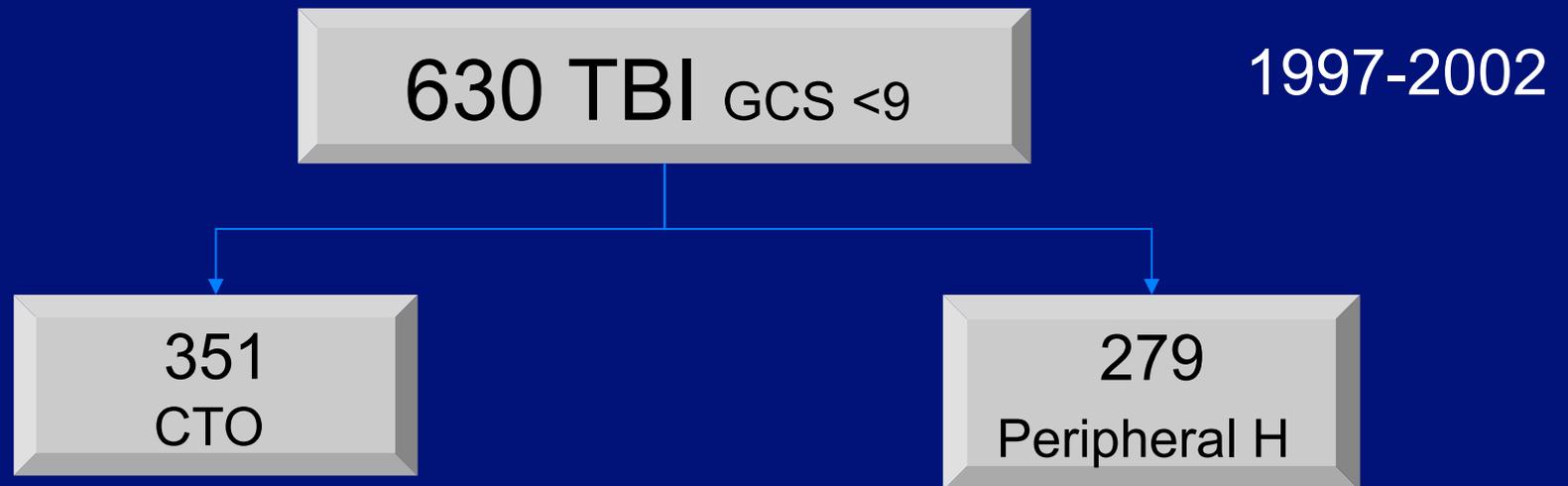
**Clinical and neuroimaging features of severely brain-injured patients treated in a neurosurgical unit compared with patients treated in peripheral non-neurosurgical hospitals**

A. VISCA<sup>1</sup>, G. FACCANI<sup>1</sup>, F. MASSARO<sup>1</sup>, D. BOSIO<sup>2</sup>, A. DUCATI<sup>4</sup>, M. COGONI<sup>3</sup>,  
J. KRAUS<sup>6</sup> & F. SERVADEI<sup>5</sup>

<sup>1</sup>*Division of Neurosurgery*, <sup>2</sup>*Department of Epidemiology*, and <sup>3</sup>*Division of Neuroradiology, Centro Traumatologico Ortopedico (CTO) Hospital*, <sup>4</sup>*Division of Neurosurgery, University of Turin, Turin*, and <sup>5</sup>*WHO Neurotrauma Collaborating Centre and Div of Neurosurgery, M. Bufalini Hospital, Cesena, Italy*, and <sup>6</sup>*UCLA, Southern California Injury Prevention Center, Los Angeles, USA*



exclusion criteria:  
severe hypotension,  
brain death  
surgically evacuated mass lesion





exclusion criteria:  
severe hypotension,  
brain death  
surgically evacuated mass lesion

630 TBI GCS <9

1997-2002

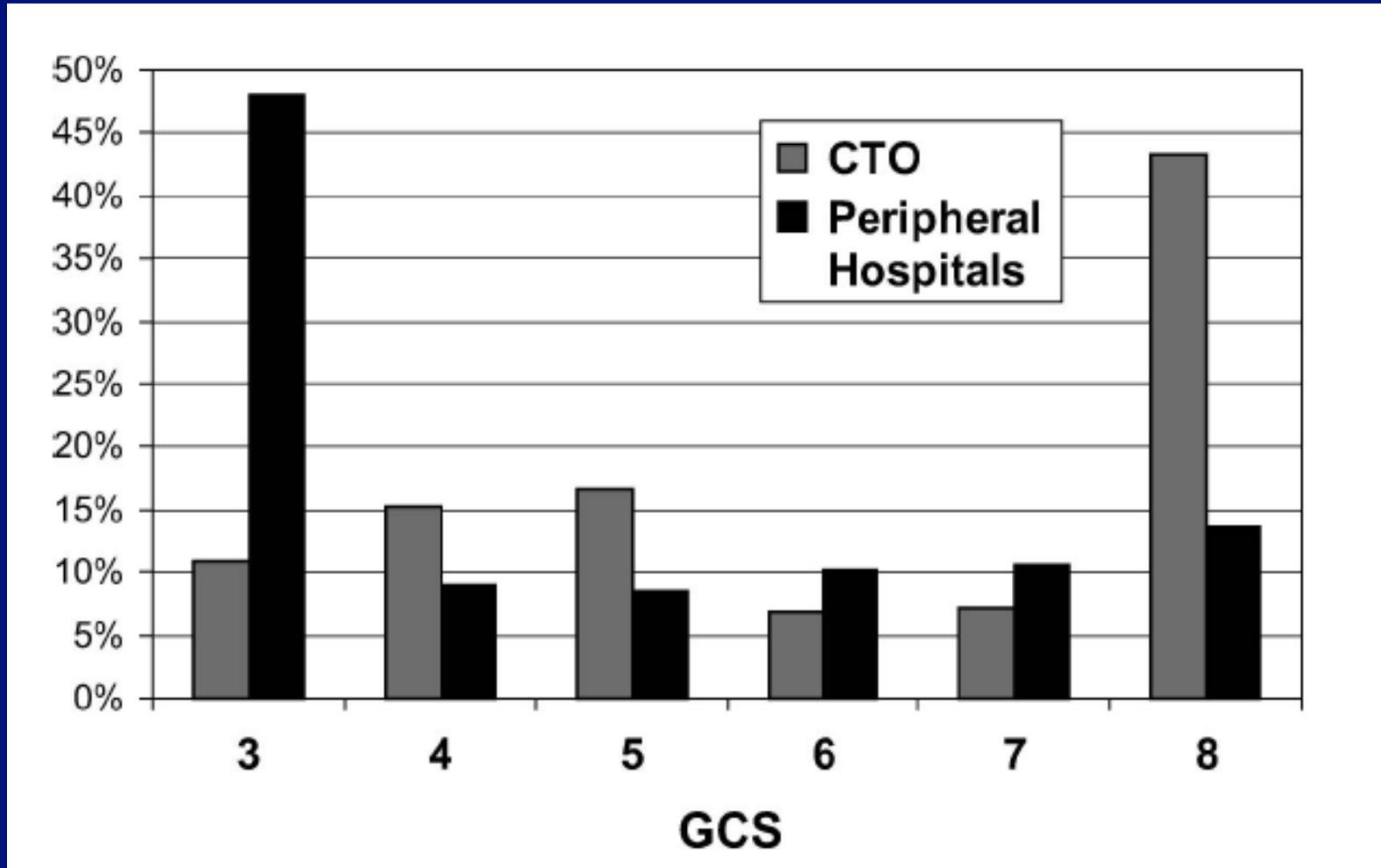
351  
CTO

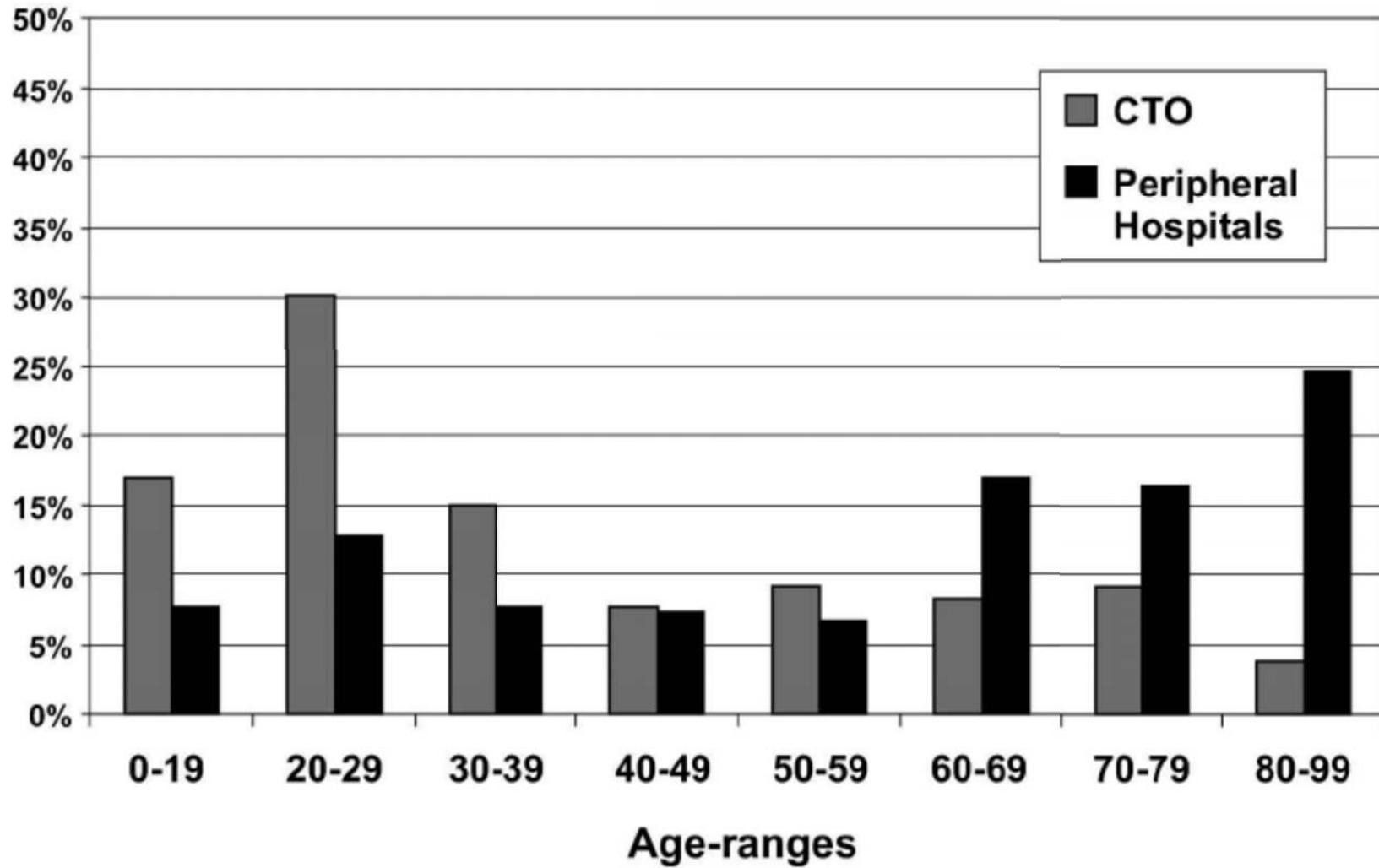
279  
Peripheral H

Favourable  
outcome

62  
%

44  
%







# Dove trasportare il malato

Se minacce immediate (pnx, tamponamento cardiaco, emorragia interna)

Se Centro di riferimento indisponibile

→  
Ospedale più vicino



# Dove trasportare il malato

Se priorità al SNC (o midollo) senza minacce immediate

Se Centro di riferimento disponibile



Centro di riferimento



# GUIDELINES FOR PREHOSPITAL MANAGEMENT OF TRAUMATIC BRAIN INJURY

Brain Trauma Foundation New York

<http://www.braintrauma.org/guideems.nsf>

[asr.regione.emilia-romagna.it/trauma/letteratura/.../index.htm](http://asr.regione.emilia-romagna.it/trauma/letteratura/.../index.htm)



The Brain Trauma Foundation was founded to improve the outcome of Traumatic Brain Injury (TBI) patients by developing best practice guidelines, conducting clinical research and educating medical personnel.

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Traumatic Brain Injury (TBI) is the leading cause of death and disability in children and adults from ages 1 to 44.

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SERVIZI SANITARI  
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**Trattamento del  
Trauma Cranico  
minore e severo**

**Linee guida  
nazionali  
di riferimento**

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**GUIDELINES**

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Treatment of minor and severe  
traumatic brain injury.  
National reference guidelines

B. RUSTICALI, R. VILLANI and the Working Group\*